American Lumberman
& BUILDING PRODUCTS MERCHANDISER

IMPORTANT:
This BOOKLET Contains Valuable Reference Material Used in NATIONAL RETAIL LUMBER DEALERS' ASSOCIATION EDUCATIONAL COURSES.

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Director of Education

- GLASS PRODUCTS
- SPECIFICATIONS
- MERCHANDISING
- CUTTING & HANDLING
- USES, SOURCES

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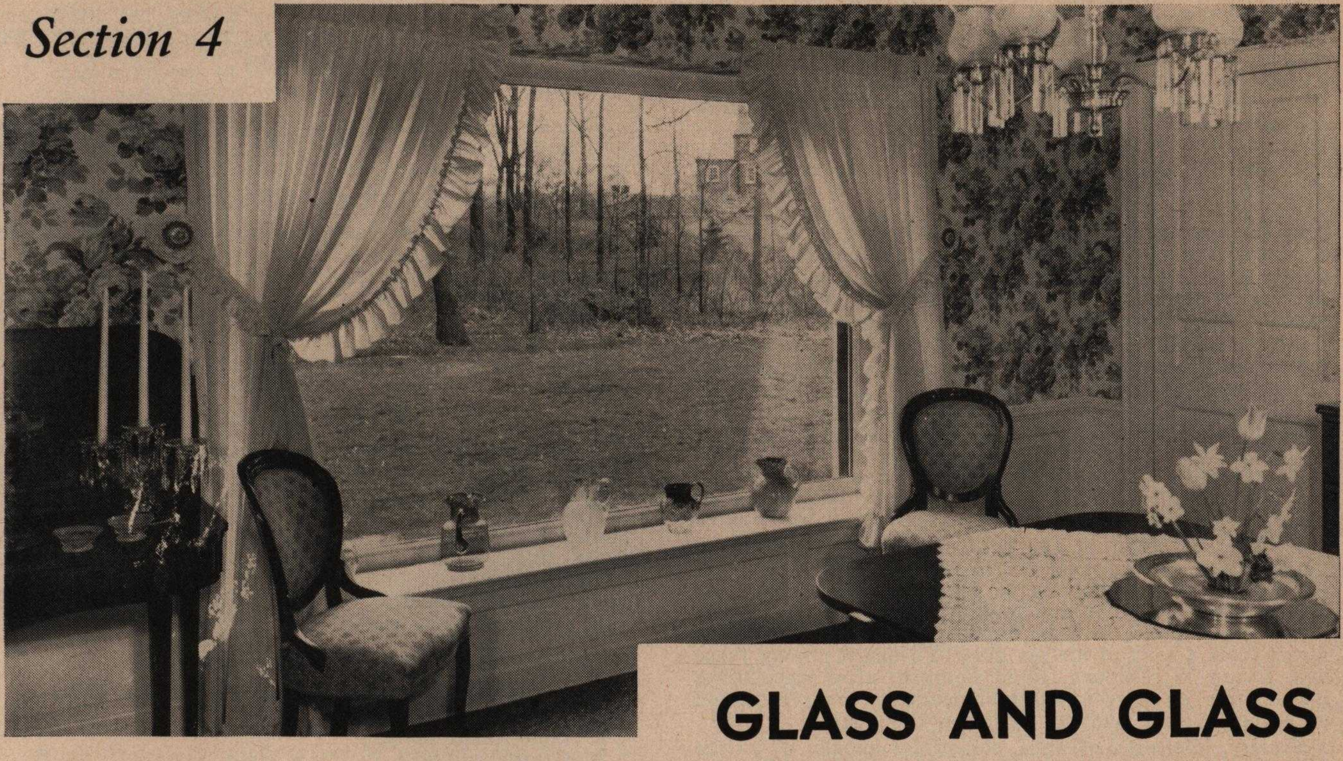
Section 4



GLASS AND GLASS SPECIALTIES

CONTENTS OF THIS SECTION

Thermopane Insulating Glass
Window Glass
Plate Glass
Mirrors
Tempered Plate Glass
Structural Glass
Laminated Safety Glass
Patterned and Wire Glass
Transparent Mirrors

Of all the many items handled by retail Lumber and Building Material Dealers perhaps only the common brick has an older history than does glass. Since the day, thousands of years ago, when the first crude glass was made, probably by the Phoenicians, it has been advanced steadily in form, quality, and useability.

The art of glass making spread to Europe and moved to America in the early 17th century. The first manufacturing venture in the new world produced glass in Jamestown, Virginia, before the Pilgrims landed at Plymouth Rock.

Since then, progress in glass making has been steady; in the last decades, spectacular. In the manufacture of flat glass old hand methods were replaced by machine processes and, finally, there came mass production methods which turned out flat glass of such high quality and in such quantities that it has become an item of constant and universal use.

Flat glass is now such an important part of our modern way of life that it is almost always within sight or reach of all of us wherever we may be—at home or at work, in church or school, in auto or bus or train or airplane, in the city or town or on the farm. It is difficult to imagine a structure of any consequence which does not involve flat glass in some form in its construction or maintenance.

It is only natural, then, that flat glass has become part of the stock-in-trade of the retail lumber and building material dealer, and is becoming an item of ever increasing importance from the standpoint of both new construction and replacement.

There are two main factors which are bringing this about. First, there is the unprecedented amount of new construction underway and planned for the future. Secondly, there is a definite trend toward the increased use of glass areas in each building unit.

New home designs call for more windows and larger windows than ever before. This is especially true in the new solar houses in which whole south walls are of glass.

The general acceptance of the Visual Front, by which commercial buildings are "opened up" to the view of passing prospects, has greatly increased the area of plate glass required in that important field.

"Daylight Engineering" which applies the latest technical skill of glass manufacturer and distributor, architects, engineers, and designers to the problems of the natural illumination of factories, schools, hospitals, and public buildings, is bringing about the increased use of glass in those types of buildings. All of these developments are stimulating immediate demand for initial sales and are increasing the already large replacement potential.

The handling of window glass has become almost traditional with lumber and building material dealers. Many also have been supplying the needs of their customers for other types of flat glass. However, a detailed knowledge of glass products and their most effective use, together with aggressive advertising, display, and merchandising, will enable the lumber and building material dealer to increase his volume in this growing field.

The following paragraphs contain simplified information on flat glass products and their application with some attention to the subject of displays and selling methods.

GENERAL CHARACTERISTICS

Today there are many forms of flat glass, each one of which is made to perform a specific function and fill a definite need. There are, however, certain general characteristics which are common to all forms. In greatly simplified terms, all flat glass is composed of sand, soda, and lime, in varying proportions and with other supplementary ingredients depending on the type desired, fused at high temperature, and drawn or cast into flat sheets. All glass is unaffected by moisture, rust, and decay of all kinds. Its polished surface is unmarred by liquids, alkalies, alcohol, and almost all acids. Its finish is hard, lasting, sanitary, easy to clean.

WINDOW GLASS

The "old standby" of the lumber and building material dealer is window glass or flat drawn sheet glass. Yet many dealers who have been selling and installing window glass for years have not had time to pause and think about its fascinating history and bright future.

Window glass has a long past. Its first commercial form probably was what is known as crown glass. This product, far from perfect by today's standards, was made by blowing a glass sphere, or bubble, on the end of a hand blow-pipe. By twirling the pipe while the glass was still soft, the bubble was spread by centrifugal force. From this shape, sheets were cut from the less curved areas and ironed in a hot oven. The result was expensive, contained many defects, produced marked visual distortion, and was never flat.

A step forward was made when the hand method was changed by swinging the bubble in a pit while lung-power was applied to the other end of the blow-pipe. This process resulted in a cylinder which was later reheated, split, and ironed. Cylinder glass was an improvement over crown glass. It gave a higher yield and was of better quality. Also larger sizes were available. But cylinder glass still distorted vision to a high degree because of the ironing process and it, too, was never flat.

Still later the cylinder process was modified by the introduction of machine blowing. This produced larger cylinders and increased output but the resulting glass was still subject to many of the defects of hand blown cylinder glass. Among other things, it was always bowed. This was especially troublesome to glaziers and installers for the bowed light of glass never laid flat along the sash rabbet. This caused excessive breakage.

By the beginning of the present century, many glass makers had decided that blown glass in any form had too many inherent defects to allow its being converted into window glass of the quality desired. Several men began the struggle to draw window glass in the flat state direct from a tank of molten glass. Foremost among these was Irving W. Colburn. Even Colburn, after exhausting his fortune on fifteen different machines over a period of several years, had not achieved the goal.

Finally, Michael J. Owens, sometimes spoken of as the Edison of the glass industry, and his associate, Edward D. Libbey, took over supervision of the development work. For an additional four years the research and experiments went on. At last, in 1916, the Libbey-Owens process, as it was known by then, was successful. For the first time window glass was drawn flat, by a continuous, automatic method, directly from its molten state in commercial quantities.

By the continuous flat-drawing process window glass can be made in much larger quantities than was the case with preceding methods. Furthermore, the quality is very greatly improved and controlled. There are fewer metal defects, such as seeds and bubbles, and less distortion.

Because glass formed by the flat-drawing process travels without interruption through long lehrs, highly controlled chambers in which glass temperatures are slowly and uniformly reduced, it is freer from strain. It, therefore, cuts more easily and breakage is reduced. Old types of window glass, because they were bowed, were more prone to break in the sash, especially during glazing operations. This troublesome and expensive difficulty has been minimized with modern drawn window glass, due to its remarkable flatness.

WINDOW GLASS SPECIFICATIONS

Classification	Quality	Thickness in Inches	Approximate Wt. Sq. Ft. in Ozs.	Maximum Size Furnished
Window Glass				
Single Strength	“AA,” “A,” “B”	.087-.100	19.50	90 united in.
Double Strength	“AA,” “A,” “B”	.118-.133	26	120 united in.
Double Strength	Greenhouse	.118-.133	26	16″ x 18″ 16″ x 24″ 18″ x 20″
3/16″ Heavy Sheet	“AA,” “A,” “B”	.187-.205	40	50 sq. ft.
7/32″ Heavy Sheet	“AA,” “A,” “B”	.210-.230	45	60 sq. ft.
Picture Glass				
19-23 lts. per in.	“AA,” “A,” “B”	.043-.053	9 to 11	60 united in.
Picture Glass				
15-17 lts. per in.	“AA,” “A,” “B”	.058-.068	12 to 14	60 united in.
Picture Glass				
12-14 lts. per in.	“AA,” “A,” “B”	.070-.080	15 to 17	60 united in.

“AA” quality is specially selected glass for high grade work.

“A” is select glass of superior glazing quality.

“B” is suitable for general glazing purposes.

Greenhouse is below “B” in quality and is available in double strength only in sizes 16″ x 18″, 16″ x 24″, and 18″ x 20″.

United Inches are determined by adding the width and the length of the size involved. Thus a light 28″ x 28″ would have 56 united inches.

PACKING

Window glass of 100 united inches and less is packed approximately 50 sq. ft. per box; over 100 united inches approximately 100 sq. ft. per box.

USES

Window glass for glazing windows, doors and storm sash in houses, apartments, and other types of buildings.

Heavy sheet glass for glazing windows and doors where greater strength is required but where slight distortion is not objectionable; for shelving, display cases, window ventilators, and furniture tops.

Picture glass for covering pictures, photographs, maps, and prints.

PLATE GLASS

In the case of window glass, described above, the two surfaces remain unchanged, just as they come from the machine, with a fire polish. Plate glass, on the other hand, is first made into blanks either by being cast in its molten state from large clay pots, or rolled in a continuous sheet from a tank. These blanks, which are usually ribbed, are then ground and finally polished on both surfaces with the objective of making them flat and parallel. This results in clear vision and a minimum of distortion.

TYPES OF PLATE GLASS

Types of plate glass in general use are as follows:

1. Regular plate
2. Color Clear plate
3. Colored plate
4. Heat Absorbing plate (to be discussed later)

Thicknesses, sizes, and weights of various types (except heat absorbing) are shown in the table below:

PLATE GLASS SPECIFICATIONS

Type or Color	Thickness	Thickness Tolerance	Standard Maximum Width and Length	Maximum Size Special Order	Approx. Weight Lbs. Per Sq. Ft.
Regular	1/8″	± 1/32″	72″ x 74″	74″ x 144″	1.64
	13/64″	± 1/32″	72″ x 74″	74″ x 144″	2.65
	1/4″	± 1/32″	124″ x 170″	124″ x 250″	3.27
	3/8″	± 1/32″	100″ x 150″	100″ x 200″	4.90
	1/2″	± 1/32″	100″ x 160″	100″ x 200″	6.54
	5/8″	± 3/64″	80″ x 140″	100″ x 160″	8.17
	3/4″	± 3/64″	80″ x 130″	100″ x 150″	9.81
	7/8″	± 1/16″	40″ x 100″	50″ x 100″	11.44
	1″	± 1/16″	40″ x 100″	50″ x 100″	13.08
	1 1/4″	± 1/16″	40″ x 100″	50″ x 100″	16.25
Color Clear	1/8″	± 1/32″	40″ x 80″	55″ x 90″	1.64
	1/4″	± 1/32″	70″ x 140″	90″ x 140″	3.27
Colors:					
Standard Blue	7/32″	± 1/32″	100″ x 140″	110″ x 170″	2.86
Medium Blue	7/32″	± 1/32″	100″ x 140″	110″ x 170″	2.86
Dark Blue	7/32″	± 1/32″	100″ x 140″	100″ x 170″	2.86
Peach	7/32″	± 1/32″	100″ x 140″	100″ x 170″	2.86
Golden	7/32″	± 1/32″	95″ x 120″	100″ x 150″	2.86

QUALITIES

Regular plate is produced in Silvering and Mirror Glazing qualities, which are used in making fine mirrors and for high quality glazing in residences, and in Glazing quality, which is used for general glazing purposes. Color Clear and colored plate are furnished in quality equivalent to regular plate glass.

USES

Below are suggested a few examples for the use of plate glass.

1. Regular plate
   - 1/8″, 13/64″—Small panes, leaded lights, railway coaches, mirrors, etc.
   - 1/4″—Windows of public and office buildings, residences and apartment buildings, show windows, show cases, street cars, railway coaches, shelving, table and desk tops, large mirrors, etc.
   - 1/2″—Portlights, long shelves, glass furniture, background for decoration, etc.
   - 1/2″ to 1 1/4″—Floor, deck and portlights on ships;

aquarium tanks, glass furniture, table and desk tops, etc.

2. Color Clear plate glass, which is exceptionally clear and colorless, is ideal for picture windows, commercial, refrigerator cases, and mirrors.
3. Colored plate glass can also be used for picture windows. It is very effective for mirrors and for various decorative effects.

HEAT ABSORBING PLATE GLASS

DESCRIPTION

Heat Absorbing polished plate glass is a product of special chemical composition, pale bluish green in color, and made to absorb a high percentage of the infra-red heat rays of the sun. Part of the absorbed heat is subsequently transferred to the interior, but a considerable portion is given off to the exterior, effecting a net reduction of the solar heat entering through the glass.

CHARACTERISTICS

Heat Absorbing plate glass ⅛" thick excludes 29½% of the total solar radiation; ¼" thick 38½%, as compared with an exclusion of 9½% afforded by regular plate glass ¼" thick. These figures are based on the assumption of 50% of the re-radiation of the absorbed heat in the glass to the interior and 50% to the exterior. This reduction of solar heat transmission, will produce a cooler atmosphere inside, resulting in lower initial cost for the air conditioning equipment and reduced cost of operation. Heat Absorbing plate glass reduces sun glare, and provides light which is restful to the eyes and nerves.

USES

Heat Absorbing plate glass is particularly suited for glazing the windows of office and apartment buildings, hospitals, schools, factories, and other types of buildings where the exclusion of solar heat is a problem. Merchants whose wares are perishable will find heat absorbing plate glass beneficial for show windows. Because of its heat absorbing characteristics, this glass helps protect merchandise such as fruits, vegetables, candy, flowers, and other perishables, helps to keep it fresh much longer. It also is useful for windows of stores and ice cream parlors where refrigerating equipment may necessarily be in line with rays of the sun coming through show windows.

THICKNESSES, SIZES, AND WEIGHTS ARE AS FOLLOWS:

Thickness	Thickness Tolerance	Standard Maximum Width and Length	Maximum Size Special Order	Approx. Weight Lbs. per Sq. Ft.
⅛"	± 1/32"	40" x 80"	55" x 90"	1.64
¼"	± 1/32"	70" x 100"	100" x 130"	3.27

MIRRORS

The spectacularly growing use of plate glass mirrors makes them increasingly important items to the lumber and building material dealer.

QUALITIES

Mirrors are graded according to the quality of plate glass used. "A"—(Silvering Quality) used only for the finest mirrors. No. 1 (Mirror Glazing Quality) used for all types of selected mirrors. No. 2 (Glazing Quality) used for all other plate glass mirrors which are termed "commercial" mirrors.

These standards correspond to those established by the Department of Commerce through the National Bureau of Standards as Commercial Standard CS27-36.

SIZE LIMITATIONS

When facing wall areas with large mirror sections, it is generally advisable to keep the size of the sections within 7 x 12 feet, although larger dimensions can be furnished for special conditions. Larger wall areas may also be covered with a series of adjacent mirrors.

USES

Mirrors are playing an increasingly important part in modern decoration and design. Architects and designers have found that mirrors bring increased light, beauty, sparkle and spaciousness into residences, hotels, apartment houses and public buildings.

A recent use of mirrors is to double the apparent size of a room or space by facing one wall or two adjoining walls with large mirror sections, attached with rosettes or mastic.

Circular mirrors for dining rooms, fireplace-to-ceiling mirrors for living rooms, full length, plate glass mirrors for bedrooms and dressing rooms, built-in-mirrors for smart powder rooms—all aid in introducing charm and dignity into modern homes.

Commercial uses for mirrors are wide and varied—up-to-the minute department stores and showrooms use large areas of mirrored surfaces for background effects, triple mirrors in clothing sections, overhead mirrors for decorative purposes. Mirrored walls and ceilings are used extensively in bars, restaurants, clubs, theaters, etc. and add decorative beauty and spaciousness where room is limited.

TRANSPARENT MIRRORS

Durability and permanence are outstanding qualities of Transparent Mirrors—a new product using evaporated chromium alloy for "one-way-mirror" installations.

With a light transmission of approximately 15% and a light reflection from the mirrored side of about 45%, the specially treated plate glass when properly installed serves as a mirror from the front, but is transparent when viewed from the back. For example:

When a Transparent Mirror is installed between two rooms, one of which is brightly lighted and the other dimly lighted, an observer in the dark room can see into the lighted one, but the glass has the appearance of an opaque mirror in the illuminated room. The perfection of the performance is governed by the difference in brightness between the two rooms. The mirrored side should be installed toward the room into which a view is desired.

SIZES

Transparent Mirrors can be obtained in ⅛" plate glass and in sizes up to 30" x 40".

USES

The following suggested uses for Transparent Mirrors are a few of many possible applications:

In residence entrance doors, hospital observation windows (particularly psychiatric), show windows, nursery doors in residences, instrument manufacturing (used in cameras and other scientific instruments), night clubs and taverns, security windows in government offices, banks, post offices, FBI offices, police departments, private offices, factories and institutions, and colleges and universities (psychology departments). The mirrors also are suitable for novel advertising signs and show windows.

TUF-FLEX TEMPERED PLATE GLASS

Tempered plate glass is made by a process of reheating and sudden cooling, as a result of which the outer surfaces are in a state of high compression while the central portion remains in tension, producing a condition highly resistant to breakage. The process can be applied to both clear and colored plate glass.

PROPERTIES

Tempered plate glass is approximately three to five times stronger than regular plate glass in sustaining loads and resisting fracture due to strain, and approximately five to seven times more resistant to ordinary impact and three times more resistant to thermal shock. It is more resistant to bending stresses than ordinary plate glass. A piece of ¼" tempered glass 42" long and 12" wide can be twisted through an angle of 20° without breaking. Tempered glass retains the same appearance, clearness, hardness and coefficient of expansion as regular plate glass. When its limit of resistance is reached, it does not break like ordinary glass, into jagged pieces, but disintegrates into small crystals.

SPECIAL CONDITIONS

Tempered plate glass can be ordered in circles, squares, rectangles and special shapes cut to pattern. It can also be supplied in a variety of edge finishes. However, since it cannot be cut after it is tempered, the exact sizes required must be specified, and intricate designs should be submitted for approval.

TYPES, THICKNESSES AVAILABLE

Types, thicknesses, and sizes of tempered plate glass available are listed in the following table:

Kind	Thickness	Min. Width	Max. Size	Thickness Tolerance	Dimensional Tolerance
Regular Plate	1/4", 3/8", 1/2"	2"	56" x 108"	±1/32"	±1/16"
	5/8", 3/4"	2"	40" x 100"	±3/64"	±1/16"
	7/8", 1", 1 1/4"	2"	40" x 100"	±1/16"	±1/16"
Color Clear Plate	1/4"	2"	56" x 108"	±1/32"	±1/16"
Colored Plate	7/32"	2"	48" x 72"	±1/32"	±1/16"
Golden Plate	7/32"	2"	48" x 72"	±1/32"	±1/16"
Heat Absorbing Plate	1/4"	2"	48" x 72"	±1/32"	±1/16"

Circles and squares are available.

COMPARATIVE MODULUS OF RUPTURE

Plate Glass	*Tuf-flex*
Average—6,000 lb./sq. in.	Average—30,000 lb./sq. in.

COMPARISON OF IMPACT

Kind of Glass	2 Lb. Steel Ball Critical Height Dropped	11 Lb. Shot Bag Critical Height Dropped
1/4" Plate	Average 8 inches	Average 37 inches
1/4" *Tuf-flex*	Average 60 inches	Average 160 inches

RESISTANCE TO THERMAL SHOCK

Kind of Glass	Average difference in temperature °F required to cause failure
1/4" Plate	147° F
1/4" *Tuf-flex*	466° F

USES

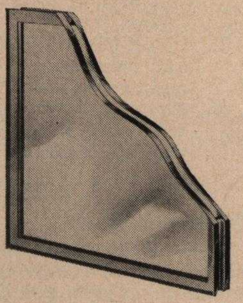
The greater strength of tempered plate glass has resulted in its wide use for visual entrance doors, ship's glazing, steam and oil pressure gauge covers, shelving, furniture, counter tops, show cases, and for enclosures in museums, zoological gardens and aquariums. Its ability to withstand impact makes it especially adaptable for balustrades, stair railings, push and kick plates on doors, windows in gymnasiums and sport arenas, and in jails, hospitals and mental institutions.

Tempered plate glass doors have come into wide use for entrances into stores, commercial buildings, and public structures of all kinds. Since they are, practically speaking, all glass they allow maximum visibility. Consequently they are especially advantageous in retail establishments.

Tempered plate doors cannot be fitted or altered on the job. This means that they must be made complete at the factory in a wide range of sizes and to quite exact dimensions. Necessary hardware, in a variety of types and finishes must also be attached at the factory. Because of these factors it is impracticable to include full information on tempered plate doors in a manual of this size. Your glass distributor has complete data on measuring, ordering and installation. Call on him whenever you see an opportunity to sell tempered plate glass doors.

THERMOPANE INSULATING GLASS

One of the most significant glass developments in recent years is Thermopane insulating glass. Because it is newer than other glass products but more because it will unquestionably become increasingly important to the building industry, Insulating Thermopane will be given a more detailed treatment than other glass products in this manual.



THIS is a cutaway view of double glazed unit. The metal-to-glass bond seals the edges of the two panes of glass.

DESCRIPTION

Thermopane is a factory-built transparent glass unit composed of two or more lights of glass separated by 1/4" or 1/2" of dehydrated captive air, hermetically sealed around the edges at the factory.

MANUFACTURE

Thermopane can be furnished in squares, rectangles or straight edge shapes, providing angles on such shapes are not too acute. It is generally fabricated to ordered sizes, but manufacturers have developed certain standard sizes (see chart).

FOUR FEATURES

1. GREATER YEAR 'ROUND INSULATION against cold and heat. Makes living conditions more healthful and comfortable and saves fuel.
2. BONDERMETIC SEAL. This metal-to-glass seal bonds the panes of glass into one unit to guard against dirt and moisture entering the dry air space.
3. CLEARER VISION. The sealed-in dry air greatly reduces the possibility of condensation on the glass.
4. ONLY TWO SURFACES TO CLEAN. The glass surfaces inside a unit are specially cleaned at the factory.

USES

Thermopane is practical for glazing of wood or metal windows and doors in homes, apartments, schools, hospitals and other structures requiring heating or air conditioning.

HEAT LOSS TRANSMISSION

Double glazed units provide a high resistance to heat flow, varying with the number of panes and the thickness of the air space used. In summer the low heat transmission coefficient reduces the load on air conditioning systems. In winter it saves heat.

The greater efficiency of double compared with single glazing makes it possible to use larger windows to keep the cost of fuel constant. It is said that a house could have 115 square feet of double glazed instead of 40 square feet of single glazing without any increased loss of heat. Double glazing permits the influx of a larger amount of the solar heat through exterior glazing of buildings without a prohibitive compensating loss by conduction. By combining various types of heat-absorbing and colored glass in the fabrication of double glazing, the amount and quality of light transmission may be controlled, if this is desirable.

Because Thermopane is an insulating unit, it reduces the coefficient of heat transfer. This increases the temperature of the surface facing the room side, thereby reducing "windowpane chills" and making living conditions more healthful and comfortable. Many builders have found this a desirable sales factor.

HEAT TRANSMISSION TABLE

The over-all heat transmission coefficient U varies with the ranges of temperature at which the coefficient is determined. For most practical heat loss calculations, coefficient U can be the value determined at 10 degrees outside temperature, 70 degrees inside temperature, 15

Number of Panes	Glass Thickness	U Value		
		Air Space		
		None	1/4"	1/2"
Single Glass	1/8"	1.16		
	1/4"	1.15		
Double Thermopane (one air space)	1/8" or 1/4"		.65	.58
Triple Thermopane (two air spaces)	1/4"		.47	.40

mph outside air velocity, 0.25 mph average inside air velocity. The table gives such values from actual tests with glass sizes 30" x 30".

EXTRA STRENGTH CONDITIONS

Where extra strength in glazing is required to withstand high pressures which would rupture standard plate glasses, insulated double glazed units can be manufactured from ¼" tempered plate glass.

STANDARD SIZES

The new standard sizes for double glazing recently have been developed in cooperation with leading manufacturers of wood and steel sash in answer to requests from many architects, designers and builders. (See chart for full details.) These standard size units comply with the American Standards Association 4" modular construction.

There are numerous advantages to specifying standard sizes. Manufacturers of wood sash have developed standard Picture Window frames and sash units using them. Glass distributors and wholesale sash and door jobbers will carry warehouse stocks of these units, thus making them more readily available. Builders can incorporate standard sizes in their specifications. Replacements and duplications of orders will be handled more quickly.

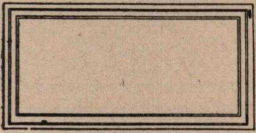
PICTURE WINDOWS—STANDARD SIZES

The new standard units are being manufactured in a wide range of sizes, readily adaptable by builders for new construction and remodeling.

The sizes for Picture Windows in single lights, double hung wood window units and residential steel sash casements are shown on the chart.

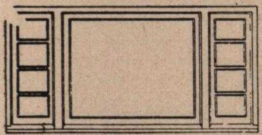
PICTURE WINDOWS — STANDARD SIZES

STANDARD WOOD PICTURE WINDOW UNITS



PICTURE WINDOW GLASS SIZE	
42" x 66"	66" x 96"
42" x 72"	72" x 84"
66" x 84"	72" x 96"

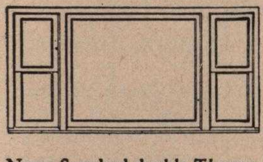
STANDARD WOOD PICTURE WINDOW UNITS WITH FLANKING CASEMENTS



Note· Standard double *Thermopane* units for above are composed of two ¼" panes of polished plate glass with ½" air space

WINDOW OPENING (Including the Casement Units) Width Height	PICTURE WINDOW GLASS SIZE Width Height
6'-5¼" x 4'-2⅜"	35½" x 48⅛"
8'-1" x 4'-2⅜"	55¼" x 48⅛"
9'-8¾" x 4'-2⅜"	75" x 48⅛"
6'-5¼" x 5'-2⁹⁄₁₆"	35½" x 60⅜"
8'-1" x 5'-2⁹⁄₁₆"	55¼" x 60⅜"
9'-8¾" x 5'-2⁹⁄₁₆"	75" x 60⅜"

STANDARD WOOD PICTURE WINDOW UNITS WITH FLANKING DOUBLE HUNG WINDOWS



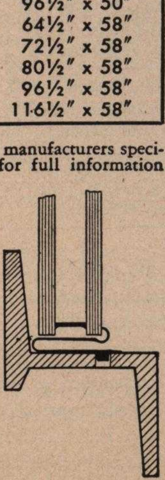
Note: Standard double *Thermopane* units for above are composed of two ¼" panes of polished plate glass with ½" air space

PICTURE WINDOW SASH OPENING (Without double hung unit) Width Height	PICTURE WINDOW GLASS SIZE Width Height
4'-4" x 4'-6"	48½" x 50"
5'-0" x 4'-6"	56½" x 50"
5'-8" x 4'-6"	64½" x 50"
6'-4" x 4'-6"	72½" x 50"
7'-0" x 4'-6"	80½" x 50"
8'-4" x 4'-6"	96½" x 50"
5'-8" x 5'-2"	64½" x 58"
6'-4" x 5'-2"	72½" x 58"
7'-0" x 5'-2"	80½" x 58"
8'-4" x 5'-2"	96½" x 58"
10'-0" x 5'-2"	116½" x 58"

Window openings will vary according to individual sash manufacturers specifications. Therefore, manufacturers should be contacted for full information regarding their units.

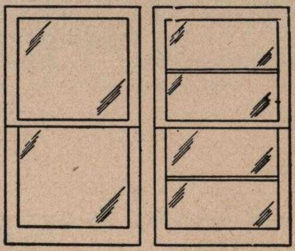
SPECIAL GLAZING CLIP

For satisfactory glazing of *Thermopane* in steel sash, use special clips developed by Libbey-Owens-Ford. The illustration shows application of the glazing clip.



DOUBLE HUNG WINDOWS

Wood sash manufacturers offer 1¾" check rail double hung windows, ASA modular coordinated, in both two-light and four-light horizontal sash as illustrated at right.



The complete range of standard sizes for double *Thermopane* double hung units is shown below.

DOUBLE HUNG WOOD WINDOWS

WINDOW OPENING Width Height	GLASS SIZES 2-LIGHT	 4-LIGHT
2'-4" x 4'-6"	24" x 24"	24" x 11⅝"
2'-8" x 4'-6"	28" x 24"	28" x 11⅝"
3'-0" x 4'-6"	32" x 24"	32" x 11⅝"
3'-4" x 4'-6"	36" x 24"	36" x 11⅝"
3'-8" x 4'-6"	40" x 24"	40" x 11⅝"
4'-0" x 4'-6"	44" x 24"	44" x 11⅝"
2'-4" x 5'-2"	24" x 28"	24" x 13⅝"
2'-8" x 5'-2"	28" x 28"	28" x 13⅝"
3'-0" x 5'-2"	32" x 28"	32" x 13⅝"
3'-4" x 5'-2"	36" x 28"	36" x 13⅝"
3'-8" x 5'-2"	40" x 28"	40" x 13⅝"
4'-0" x 5'-2"	44" x 28"	44" x 13⅝"

Double *Thermopane,* manufactured with two lights of Double Strength "A" quality L·O·F Window Glass with ¼" air space between, is standard for double hung windows.

RESIDENTIAL STEEL SASH

Double *Thermopane,* manufactured with two lights of Double Strength "A" quality L·O·F Window Glass with ¼" air space between, is standard for residential steel casement windows.

STANDARD *THERMOPANE* SIZES

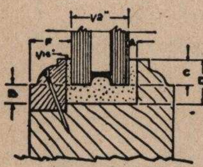
16" x 12", 16" x 11⁵⁄₁₆", 14" x 12", 14" x 11⁵⁄₁₆", 14" x 10", 14" x 9⁵⁄₁₆", 14¾" x 12", 17¼" x 12", 12" x 12".

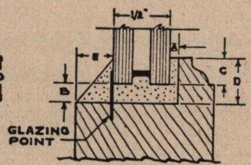
THERMOPANE GLAZING DETAILS

It is extremely important to remember that *Thermopane* is a factory-fabricated unit and once made to specifications, its dimensions cannot be changed at point of use. Proper glazing clearances must be allowed on all *Thermopane* units, as well as sufficient rabbet depth, so that the metal seal does not show. The adjacent chart and drawings below give this information.

Symbol	Symbol Explanation	Glass Thickness					
		D. S. A. ⅛" Plate ⅛" Figured	³⁄₁₆" Sheet Glass		¹³⁄₆₄" or ¼" Plate ⁷⁄₃₂" or ¼" Figured		
A	Bed Putty—Width	¹⁄₁₆"—⅛"	¹⁄₁₆"—⅛"	¹⁄₁₆"—⅛"	⅛"	⅛"	⅛"
B	Glazing Clearance (all edges)	⅛"	⅛"	³⁄₁₆"	⅛"	³⁄₁₆"	¼"
C	Metal Edge—Depth	⅜"	⅜"	⅜"	⅜"	½"	½"
D	Total Rabbet Depth (Clearance & metal, B+C)	½"	½"	⁹⁄₁₆"	½"	¹¹⁄₁₆"	¾"
E	Putty—Width	½"+*	⅝"+*	¾"+*	¾"+*	Wood Stops Only	
F	Wood Stop—Width	½"+	⅝"+	¾"+	¾"+	⅞"+	1"+
	Glass Sizes	8" x 8" to 32" x 48" and 12" to 18" wide by 60" long or under 80 united inches	8" x 8" to 32" x 48" or under 80 united inches	34" x 48" to 36" x 72" or from 80 to 120 united inches	8" x 8" to 32" x 48" or under 80 united inches	34" x 48" to 38" x 82" or sizes not over 40" wide from 80 to 120 united inches	40" x 40" to 50" x 120" and 60" x 100" or any sizes over 120 united inches

*Wood stops preferable.





AIR SPACE—¼" or ½" air spaces can be furnished on all units up to the maximum size shown in the chart on page 5, but for building exteriors sizes 50" wide and over will be furnished with ½" air space only.

DOUBLE *THERMOPANE* TYPES OF GLASS AND SIZES

Type of Glass	Min. Size ¼" or ½" Air Space	Max. Size with ¼" Air Space	Max. Size with ½" Air Space	Thickness Range		Dimensional Tolerance	Approx. Ave Net Weight per Sq. Ft.
				¼" Air Space	½" Air Space		
D.S.A. ⅛" Blue Ridge Figured ⅛" Plate ⅛" Heat Absorbing Plate	8" x 8"	32" Max. Width Length Not to Exceed 4½ times width. Total Area 1400 Sq. In.	24" Max. Width Length Not to Exceed 4½ times width. Total Area 1400 Sq. In.	⁷⁄₁₆" to ⁹⁄₁₆"	¹¹⁄₁₆" to ¹³⁄₁₆"	+¹⁄₁₆" −¹⁄₁₆"	3½ lbs.
³⁄₁₆" Sheet	8" x 8"	42" Max. Width 72" Max. Length	42" Max. Width 72" Max. Length	⁹⁄₁₆" to ¹¹⁄₁₆"	¹³⁄₁₆" to ¹⁵⁄₁₆"	+⅛" −¹⁄₁₆"	5 lbs.
¼" Plate	8" x 8"	48" Max. Width. 132" Max. Length. Total Area 4800 Sq. In.	98" Max. Width. 132" Max. Length. Total Area 9600 Sq. In.	¹¹⁄₁₆" to ¹³⁄₁₆"	¹⁵⁄₁₆" to 1¹⁄₁₆"	8" to 36" wide +⅛" −¹⁄₁₆" 36" to 60" wide +³⁄₁₆" −¹⁄₁₆"	7 lbs.
¼" Color Clear Plate		48" Max. Width. 132" Max. Length. Total Area 4800 Sq. In.	70" Max. Width. 132" Max. Length. Total Area 9240 Sq. In.				
¼" Heat Absorbing Plate	8" x 8"	48" Max. Width. 100" Max. Length. Total Area 4800 Sq. In.	70" Max. Width. 100" Max. Length. Total Area 7000 Sq. In.	¹¹⁄₁₆" to ¹³⁄₁₆"	¹⁵⁄₁ " to 1¹⁄₁₆"		7 lbs.
⁷⁄₃₂" Colored Plate	8" x 8"	48" Max. Width. 120" Max. Length. Total Area 4800 Sq. In.	60" Max. Width. 120" Max. Length. Total Area 6000 Sq. In.	⅝" to ¾"	⅞" to 1"		6¼ lbs.
⁷⁄₃₂" Blue Ridge Figured	8" x 8"	48" Max. Width. 100" Max. Length. Total Area 4800 Sq. In.	48" Max. Width. 100" Max. Length. Total Area 4800 Sq. In.	⅝" to ¾"	⅞" to 1"		6 lbs.
Tuf-flex (¼") in Polished Plate, Color Clear, Heat Absorbing and Colored Plate	8" x 8"	40" x 48"	40" x 48"	¹¹⁄₁₆" to ¹³⁄₁₆"	¹⁵⁄₁₆" to 1¹⁄₁₆"	+⅛" −¹⁄₁₆"	7 lbs.

For building exteriors, sizes 48" wide or over will be manufactured with ½" air space only.

VITROLITE STRUCTURAL GLASS

DESCRIPTION

Structural glass is opaque colored glass, 11/32" or more in thickness, which can be applied to walls and other vertical or horizontal areas. It offers a practical means of attaining unusual beauty that is preserved by characteristics inherent in glass. Panels provide a more pleasant appearance than areas made up of many smaller pieces. Joints are so narrow as to hardly be noticeable.

CHARACTERISTICS

Structural glass is opaque, homogeneous, non-absorbent and impervious to moisture. Possesses high tensile and crushing strength, and is highly resistant to absorption. It will not warp, swell or craze. Liquids in common use cannot penetrate it, and it will not absorb liquids or gases that give off unpleasant odors. It is not easily stained and will not burn. It is difficult to write or mark upon and is easily cleaned by the whisk of a damp cloth—or in extreme cases by the application of soap and water. Because of these characteristics structural glass has won the favor of builders and home owners.

The color of structural glass is not a coating—it is all through the glass, providing a deep lustrous tone that is unharmed by weathering, steam, water or other elements that cause deterioration of less stable surfaces. Structural glass bathroom walls are the pride of home owners after many years of subjection to splashing and washing. The structural glass colors were selected after much study to attain shades that blend well with each other. These colors harmonize beautifully with standard colors used by kitchen and bathroom fixture manufacturers. And the colors are in shades that blend readily with drapes, curtains and other home decoration elements.

SIZE LIMITATIONS RECOMMENDED

For the maximum of beauty, strength and efficiency, structural glass panels should be restricted to the following range of sizes according to the type of installation: bathroom and kitchen walls, 8" x 12" to 24" x 24"; interior walls for commercial buildings up to 30" x 36"; storefront facing, 6 square feet; toilet partitions, up to 60" x 60".

COLORS AND THICKNESSES

Vitrolite Colors	Fire Polished	Ground and Polished
White	11/32", 7/16" and 3/4	
Peach	11/32"	
Jade	11/32"	
Light Gray	11/32"	
Red		11/32"
Black		11/32", 7/16" and 3/4"

Thickness Tolerance: ± 1/32"
Weights: Net Weight, lbs. per sq. ft.: 11/32", 4.4 lbs.; 7/16", 5.6 lbs.; 3/4", 10.2 lbs.
***Vitrolite* colors are available subject to stock on hand or additional manufacture.**

INSTALLATION

Structural glass can be applied over any relatively flat hard wall surface that is not subject to warping. (It should not be installed on wood.)

It is installed in interiors with mastic and 1/64" joints buttered or pointed with joint cement. Pointing is usually sufficient but for shower partitions and wainscoting, the joints should be buttered and pointed. For exterior installation, it is attached with asphaltic mastic and supported at the lower edge adjoining the sidewalk and at horizontal joints by concealed shelf angles or by metal angles having facing shapes that overlap. All joints on exteriors should be 1/16", buttered and pointed with joint cement. All horizontal joints should be cushioned with adhesive cork tape.

Direct contact with metal, concrete or other hard substances should be avoided and some kind of cushioning material should always be provided. Abutting edges should be ground and chamfered, exposed edges polished and chamfered or finished with quarter round. Avoid sharp mitered corners. Corners subjected to rough usage should have metal guards. The extremities of a storefront installation should be protected with a suitable metal member. Top courses should have projecting member of metal or other material provided with a drip. Distance from background wall or surface to face, 5/8" to 3/4" for 11/32"; 3/4" to 7/8" for 7/16". Your glass distributor has details and specifications for structural glass construction available upon request, also booklets dealing with storefronts, theaters, restaurants, table tops, counters and soda fountains, bathrooms, kitchens, etc.

USES

The applications of structural glass are as general as the desire for long-lasting beauty. Facing of storefronts and exteriors of buildings. Lobbies of hotels and office buildings. Wainscoting for partitions, corridors, washrooms, toilets and shower baths in public buildings. In homes—for wainscoting of bathrooms, kitchens, breakfast rooms as well as work table tops and splash backs.

LAMINATED SAFETY GLASS

Many lumber and building material dealers, especially in those localities not being served by Auto Glass dealers, have built up profitable business in laminated safety glass. They have equipped themselves to install safety glass at retail or for nearby auto repair concerns.

Safety glass is a glass unit composed of two lights of glass laminated with an interlayer of transparent plastic by a process involving extreme heat and pressure.

A series of improvements have marked the development of safety glass, chiefly involving the plastic interlayer. The present type, the best yet developed, is called Hi-Test Safety Glass because of the Hi-Test Polyvinyl acetal plastic used as the interlayer sheet. This plastic has unusual strength, elasticity, and adhesion.

When safety glass is fractured, the particles of glass tend to adhere to the plastic, affording more protection against flying glass fragments.

TYPES

In the table below various types of laminated safety glass are described as follows:

Thin safety glass is made up from two lights of picture glass.

S.S. from two lights of single strength window glass.

Combination from one light of single strength and one light of double strength.

D.S. from two lights of double strength.

Safety plate from two lights of thin plate glass.

Kinds of Glass	SAFETY GLASS		Thickness Tolerance	Maximum Size	Net Weight Lbs. Per Sq. Ft.
	Number of Lights	Thickness of Safety Glass			
Thin Safety Glass	2	5/32"	− 1/32"	Up to 7 sq. ft.	1.75
S.S. Safety Glass	2	7/32"	± 1/32"	Sizes up to 15 sq. ft. of area 60" x 74"	2.63
Combination Safety Glass (S.S. & D.S.)	2	15/64"	±1/32"		3.00
D.S. Safety Glass	2	1/4"	±1/32"		3.05
Safety Plate	2	1/4"	±1/32"		3.05

Heavy Safety Plate: 2 ply, thicknesses—11/32", 3/8", 13/32", 1/2", 5/8", 3/4", 7/8", 1"; maximum size 60" x 74"; weights ranging from 4.47 to 13 lbs. per sq. ft.; thickness tolerance ±1/32" for thicknesses 11/32" to 5/8"; ±1/16" for thicknesses 3/4" to 1"
Bullet Resisting Glass: thicknesses—3/4", three ply; 7/8" and 1", four ply; 13/16", 19/16", 23/32", five ply; 2½", 7 ply; 3", 9 ply. Maximum sizes, 43" x 63" or 33" x 73". Weights range from 9.75 to 39 lbs. per sq. ft. on basis of 156 lbs. per cubic ft. Thickness tolerance ±1/16" for thicknesses 3/4" to 23/32"; ±3/32" for thicknesses 2½" to 3".
Tuf-flex plate glass in thicknesses of 1/4" to 1¼" can be combined into Safety Glass to maximum sizes of 18" x 24"
Requirements for Safety Glass or Bullet Resisting Glass other than listed should be submitted for consideration.

USES

Windows and windshields in automobiles, buses, trucks, railway coaches, airplanes, etc. View panels and barriers for animal cages in zoos and aquariums. Windows, doors, screens, glass furniture or any use where breakage or collapse of glass might cause damage or injury.

Bullet-resisting glass, composed of multiple laminated layers of glass and plastic is used for enclosures in banks, cashiers' cages, jewelry stores and as protective guards or screens.

Safety glass cannot be set with the types of putty or mastic ordinarily used in glazing because they are likely to cause deterioration of the plastic.

CUTTING AND INSTALLATION

For detailed instructions on cutting and installing safety glass ask your glass distributor.

PATTERNED & WIRE GLASS

Various types of Patterned and Wire Glass have been handled by lumber and building material dealers for many years. At one time there were relatively few patterns, which were used rather indiscriminately, chiefly to obscure vision. Since then, however, great strides have been made in the design and application of patterned glasses. There is now a pattern or type of glass scientifically designed to meet every need of light transmission and diffusion. Also many new patterns have been introduced to produce a modern, decorative effect.

In addition to the plain fire finish, with which the glass emerges from the forming rolls, patterned glasses can be obtained with other types of surface processing:

Satinol—a treatment of one or both surfaces which imparts a soft satin finish to the glass. This increases its obscurity and spreads the transmitted light uniformly over a wide area. Satinol surfaces do not finger mark or collect dust and dirt as does sandblasted glass. They can be cleaned with either a dry or slightly damp cloth.

Satinol finish, one surface, reduces light transmission about 3%. Satinol finish, two surfaces, reduces light transmission about 6%.

Frosting—primarily a functional treatment of the glass surfaces achieved by acid etching to improve the distribution of light.

Sandblasting—another surface treatment. This also enhances obscurity of the glass and spreads light in a circular pattern.

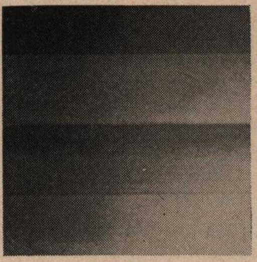
Sandblasting on one surface reduces light transmission about 16%, and 20% to 30% when applied to both surfaces, depending on type of glass.

HEAT TEMPERING

Most patterns can be heat-tempered to resist certain types of impact and thermal shock.

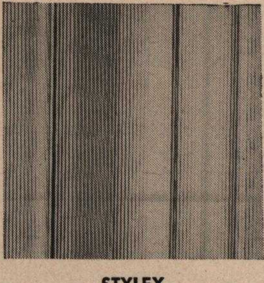
DESCRIPTION AND USES

Illustrated and described below are five patterns of distinctive design which are outstandingly suitable for decorative effects. They are especially effective for partitions, doors, transoms, side lights, screens, illuminated panels, and other decorative purposes.



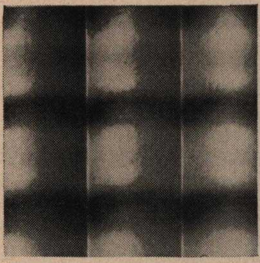
LOUVREX

Alternating ascending and descending plane-surface louvers, one inch wide. Fairly transparent; obscurity and diffusion increased with Satinol finish. Approx. light transmission—90.4%.



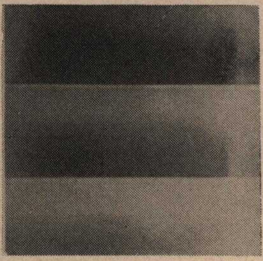
STYLEX

One smooth and one patterned side with curved, parallel concave waves 3/64″ deep and ¾″ crest-to-crest with approximately 15 parallel ribs. Approx. light transmission—78%.



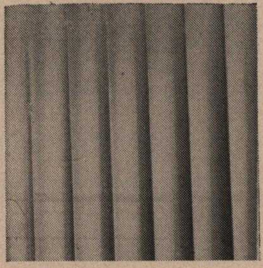
DOUBLEX

Doubled-patterned, with corrugated design on one side running at right angles to fluted design on the other, creating overall pattern of one-inch squares. Approx. light transmission—87%.



FLUTEX

Linear design with adjoining convex flutes one inch wide. Approx. light transmission—89%.



LINEX

One smooth surface and a patterned side with curved, parallel concave flutes 3/64″ deep and ½″ crest-to-crest. Approx. light transmission—80%.

In addition to the five decorative glasses already described there are other patterns designed for various uses.

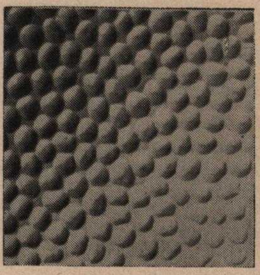
SPECIFICATIONS FOR 5 IMPORTANT DECORATIVE GLASSES

Product	Uses	Light Diffusion and Obscurity	Pattern	Thickness	Standard Max.* Width and Length	Surface				Approx. Weight Sq. Ft. Lbs. Glass Only
						Fire Polished	Ground and Polished	Frosted** Max. Width and Length	Satinol ***	
Louvrex	Decorative Interior and Exterior Use	Slight	Alternate 1″ Angular planes	⅛″	54″ x 132″	X			X	1¾ lbs.
				7/32″	54″ x 136″	X	X		X	2¾ lbs.
Flutex	Decorative Interior and Exterior Use	Slight	Adjoining 1″ convex flutes	⅛″	48″ x 132″	X			X	1¾ lbs.
				7/32″	54″ x 136″	X	X		X	2¾ lbs.
Doublex	Decorative Interior and Exterior Use	Good	1″ Block Pattern	7/32″	54″ x 136″	X			X	2¾ lbs.
Stylex	Decorative Interior Use	Medium (Directional Spread)	Fine Ribs on Flute	⅛″	48″ x 132″	X		30″ x 120″	X	1¾ lbs.
				7/32″	48″ x 136″	X	X	30″ x 120″	X	2¾ lbs.
Linex	Decorative Interior and Exterior Use	Slight	½″ Concave Flutes	⅛″	48″ x 132″	X		30″ x 120″	X	1¾ lbs.
				7/32″	48″ x 136″	X	X	30″ x 120″	X	2¾ lbs.

*In some patterns widths are available up to 60 inches depending upon stocks on hand.

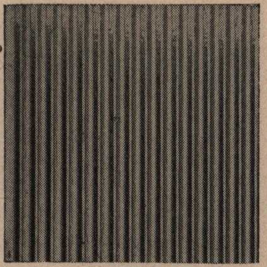
**Frosted Glass provides excellent diffusion of light and excellent obscurity.

***Satinol Processed Glass provides good diffusion of light and good obscurity with a minimum loss of light.



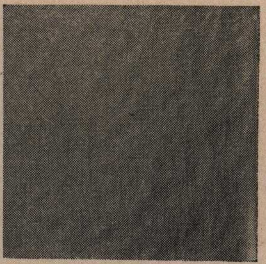
HAMMERED

Raised, adjacent lenses diffuse light at moderate angles in all directions. Approx. light transmission: unwired—90%, wired—84%. Uses—interior and exterior industrial glazing.



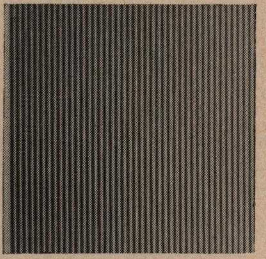
SKYTEX

Obscure; 9 parallel ribs per inch; drains off condensation; diffuses light along axis of ribs. Approx. light transmission: unwired — 78.9%, wired—72.9%. Uses—Chiefly for skylights; also suitable for general industrial glazing.



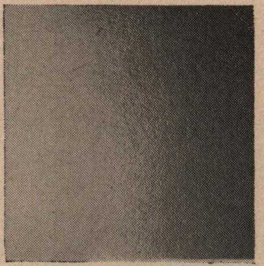
LUMINEX

Almost transparent with very fine texture, easy to clean, slight diffusion. Approx. light transmission: unwired — 88.4%, wired — 82.4%. Uses — Industrial and commercial glazing for maximum light transmission.



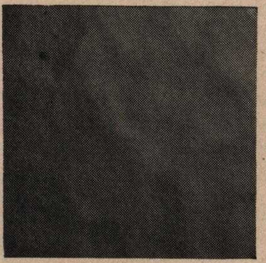
RIBBED

Fine, parallel ribs, approximately 21 per inch, spreading light in one direction—perpendicularly to ribs. Approx. light transmission: unwired — 84.4%, wired — 78.4%. Uses—factory glazing and skylights.



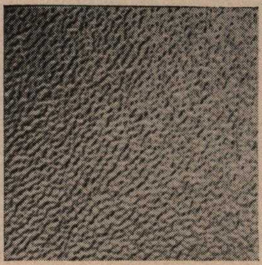
POINTEX

Semi-transparent, with one smooth side and one with multiple bosses creating a fine, stippled appearance. Approx. light transmission: unwired—92.5% (not made in wired). Uses—Interior glazing, also for signs in frosted finest.



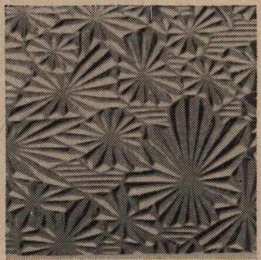
VELVEX

Semi-transparent, slightly diffusing overall pattern. Approx. light transmission: unwired—89% (not made in wired). Uses—Interior glazing, partitions, doors, transoms, shower stall doors.



MURALEX

Fairly obscure, finely engraved design for medium light distribution. Approx. light transmission: unwired—86% (not made in wired). Uses—Widely for interior partitions, doors, transoms, and ceiling lights.



FLOREX

Brilliant floral print without sharp corners and depressions. Approx. light transmission: unwired—86.2% (not made in wired) Uses — Interior glazing — partitions, doors, transoms, shower stall doors.

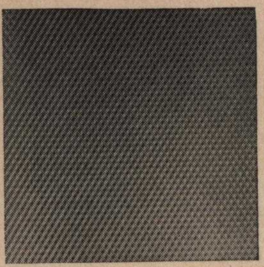
SPECIFICATIONS FOR PATTERNED GLASS

Product	Uses	Light Diffusion and Obscurity	Pattern	Thickness	Standard *Max. Width and Length	Surface				Approx. Weight Sq. Ft. Lbs. Glass Only
						Fire Polished	Ground and Polished	Frosted** Max. Width and Length	Satinol***	
Hammered	Industrial Glazing	Medium	Raised Adjacent Lenses	⅛″	48″ x 132″	X		30″ x 132″		1¾ lbs.
				7/32″	48″ x 136″	X		30″ x 136″		2¾ lbs.
				⅜″	48″ x 90″	X		30″ x 90″		5 lbs.
				½″	48″ x 90″	X		30″ x 90″		6 lbs.
Ribbed	Industrial Glazing	Medium (Directional Spread)	Fine Parallel Ribs	⅛″	48″ x 132″	X		30″ x 132″		1¾ lbs.
				7/32″	48″ x 136″	X		30″ x 136″		2¾ lbs.
				⅜″	48″ x 90″	X		30″ x 90″		5 lbs.
				½″	48″ x 90″	X		30″ x 90″		6 lbs.
Luminex	Industrial Glazing For Maximum daylight	Slight	Smooth, fine texture	⅛″	48″ x 132″	X		30″ x 132″	X	1¾ lbs.
				7/32″	48″ x 136″	X		30″ x 136″	X	2¾ lbs.
Pointex	General Glazing	Slight	Irregular Raised Bosses	⅛″ (thin)	48″ x 120″	X		30″ x 120″		1½ lbs.
Skytex	Industrial Glazing	Good (Directional Spread)	Parallel Ribs	⅓″	48″ x 132″	X		30″ x 132″		1¾ lbs.
				7/32″	48″ x 136″	X		30″ x 136″		2¾ lbs.
Velvex	Interior partitions, doors, transoms	Slight	Smooth mottled texture	⅛″	48″ x 132″	X		30″ x 132″	X	1¾ lbs.
				7/32″	48″ x 136″	X		30″ x 136″	X	2¾ lbs.
Industrex	Factory Glazing	Medium	Compact, lens-shaped	⅛″	48″ x 132″	X		30″ x 132″		1¾ lbs.
				7/32″	48″ x 136″	X		30″ x 136″		2¾ lbs.
Diffusex	Interiors for soft light diffusion	Medium	Elevated small lenses	⅛″	48″ x 132″	X				1¾ lbs.
				7/32″	48″ x 136″	X	X			2¾ lbs.
Pebblex	Interior Glazing	Good	Irregular-pebbled effect	⅛″	48″ x 132″	X				1¾ lbs.
				7/32″	48″ x 136″	X	X			2¾ lbs.
Reglex	Interior Glazing	Good	Regular Pyramidal Indentations	⅛″	48″ x 132″	X				1¾ lbs.
				7/32″	48″ x 136″	X	X			2¾ lbs.
Muralex	Finer Interior Glazing	Good	Finely engraved-indeterminate	⅛″	48″ x 132″	X				1¾ lbs.
				7/32″	48″ x 136″	X	X			2¾ lbs.
Florex	Interior Glazing	Good	Floral	⅛″	48″ x 132″	X				1¾ lbs.
				7/32″	48″ x 136″	X				2¾ lbs.

*In some patterns widths are available up to 60 inches depending upon stocks on hand.

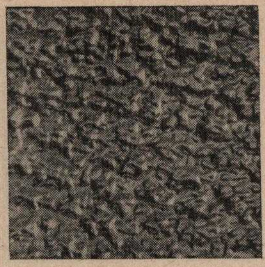
**Frosted Glass provides excellent diffusion of light and excellent obscurity

***Satinol Processed Glass provides good diffusion of light and good obscurity with minimum loss of light.



INDUSTREX

Tiny lens-shaped figures give diffusion over a moderate angle; easily cleaned. Approx. light transmission: unwired — 88.2%, wired — 82.2%. Uses—Primarily for factories; also suitable for some types of commercial structures. Not recommended for office partitions.

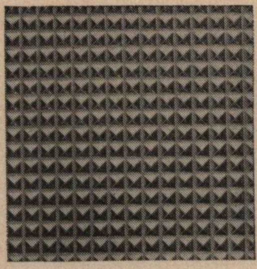


PEBBLEX

Deeply imprinted irregular pebbled design; highly obscure; brilliant appearance; diffuses light at wide angles. Approx. light transmission: unwired—79.7% (not made in wired). Uses —Office partitions and general interior glazing for well lighted privacy.

DIFFUSEX

Small, grouped lenses, spaced to avoid dirt collection. Gives uniform illumination at moderate angle of diffusion.
Approx. light transmission: unwired—87.6% (not made in wired). Uses—Interiors and exterior glazing—transoms, partitions, etc. Very popular for outdoor reflective signs.



REGLEX

Pyramid-shaped indentations, 64 per sq. in.; gives obscurity and excellent light diffusion in cross-shaped pattern.
Approx. light transmission: unwired—52.3% (not made in wired). Uses—General interior glazing; especially suitable for partitions and doors.

WIRE GLASS

Several of the patterns already mentioned can be obtained in wire glass to be used where extra strength and a fire retardant glass is required. Wire glass is made by a continuous rolling process in which the wire, previously chromium dipped to insure clean wire and to improve adhesion to the glass, is embedded as closely to the center of the glass as possible.

In referring to the table (below) bear in mind that sizes shown there are the maximum obtainable. The glass actually used will be of much smaller dimensions. The rules of the National Board of Fire Underwriters limit the size of wire glass which can be glazed in openings exposed to fire hazard. In no case shall the unsupported area of the glass measure more than 48 inches in either dimension or exceed 720 square inches. Typical maximum sizes would be 15 x 48, 18 x 40, 20 x 36, and 24 x 30.

All of the wired patterns mentioned in the table below, with the exception of Nuweld polished wire, contain the conventional hexagonal wire mesh. In Nuweld polished wire, the wires are welded together at each intersection to form a diagonal pattern.

Polished wire glass is ground and polished on both surfaces by a process similar to that used in making plate glass. As a result, maximum vision and minimum distortion are obtained.

SPECIFICATIONS FOR WIRE GLASS

Product	Uses	Light Diffusion and Obscurity	Pattern	Thickness	Standard *Max. Width and Length	Surface			Approx. Weight Sq. Ft Lbs Glass Only
						Fire Polished	Ground and Polished	Frosted** Max. Width and Length	
Hammered	**Windows, skylights and partitions requiring non-scatterable, fire-retardant glass. Registered as Fire Retardant No. R2129 by Underwriters' Laboratories, Inc.**	**Medium**	**Raised Adjacent Lenses**	¼"	48" x 144"	X		30" x 144"	3½ lbs.
				⅜"	48" x 90"	X		30" x 90"	5 lbs.
				½"	48" x 90"	X		30" x 90"	6½ lbs.
Ribbed		**Medium (Directional Spread)**	**Fine Parallel Ribs**	¼"	48" x 144"	X		30" x 144"	3½ lbs.
				⅜"	48" x 90"	X		30" x 90"	5 lbs.
				½"	48" x 90"	X		30" x 90"	6½ lbs
Luminex		**Slight**	**Smooth fine texture**	¼"	48" x 144"	X		30" x 144"	3½ lbs.
Skytex		**Good (Directional)**	**Parallel Ribs**	¼"	48" x 144"	X		30" x 144"	3½ lbs.
Industrex		**Medium**	**Compact Lens-shaped**	¼"	48" x 144"	X		30" x 144"	3½ lbs.
Hex. Mesh Polished Wire		**None**		¼"	60" x 144"		X		3½ lbs.
Nuweld Polished Wire		**None**		¼"	60" x 144"		X		3½ lbs.

***In some patterns widths are available up to 60 inches depending upon stocks on hand**

****Frosted Glass provides excellent diffusion of light and excellent obscurity**

AKLO HEAT ABSORBING AND GLARE REDUCING GLASS

Aklo is a "low expansion" patterned and wire glass, blue-green in color, having an extremely high resistance to passage of the sun's infra red heat energy and transmitting daylight of a pleasing and eye-resting quality.

Aklo is also widely used to overcome direct and reflected glare from sunlight. For this purpose, frosted surfacing should always be used.

See specifications chart for Aklo on the next page.

PROCESSING

Most types of flat glass can be obtained with various types of processing. One or both surfaces may be sandblasted—either over-all or to designs—and in several textures and depths. The same applies to structural glass which, in addition, may be inlaid with glass of another color.

Glass may be obtained with a variety of edge finish such as ground, ground and polished, penciled (half round), mitered, and bevelled.

Glass may also be obtained cut to pattern shapes, drilled, notched, and with finger pulls.

With the exception of tempered glass, which must have all processing done at the factory before heat treating, most processing is performed by the glass distributor. Your glass distributor can give you detailed information on processing. He can also furnish you information on measuring, estimating, ordering and installing bent glass. All forms of flat glass, except tempered plate, can be bent, but this is a specialized field requiring your glass distributor's expert advice.

CUTTING

Plate glass in larger sizes and several other types of glass will undoubtedly be ordered cut to size from your glass distributor. But window glass and some patterned glass will be cut to size by the lumber and building material dealer. The manner in which this cutting operation is carried out affects profits. Here are some suggestions:

Carry an adequate assortment of sizes in window glass. This reduces cutting loss or wastage. Maintain easily accessible bins clearly marked as to size and keep them as well filled as you can. This will make it possible and convenient to select the most economical size from which to cut the required light.

Never try to cut glass on an uneven or unstable, makeshift surface. Have a good, firm, flat cutting table, reserved for glass cutting only. The top should be covered with heavy felt or carpeting. Keep your table clean at all times; brush off small particles of glass to prevent their scratching the light you are cutting.

Secure good glass-squares and hooked rules. Keep them hung up where they will not be damaged when not in use. Use the best wheel cutter you can buy. It will save you money. Grasp the cutter firmly and make a clean, straight cut with a free motion and with the bottom edge of the cutter parallel with the surface of the glass. Judge your cut by the "sing" of the cutter so as to get the right pressure. Never run the cutter over the same spot twice. Don't make a "white" cut nor one which flakes.

Snap the glass, after cutting. If the cut is near the edge, use a pair of good glass pliers—not mechanics pliers—keeping the lips of the pliers close to the cutter mark.

When you have finished, check your light for correct size, return tools to proper places, put cutter in can or jar of light oil. If cutter has started skipping break the handle in two and throw it away so that it can never be used again and cause breakage.

SPECIFICATIONS FOR AKLO HEAT ABSORBING GLASS

(Continued from page 12)

Product	Uses	Light Diffusion and Obscurity	Pattern	Thickness	Standard *Max. Width and Length	Surface			Approx. Weight Sq. Ft. Lbs.
						Fire Polished	Ground and Polished	Frosted** Max. Width and Length	
				figured glass					
AKLO—Hammered	**For windows, skylights and transoms to substantially reduce sun's heat, admit daylight and improve illumination**	**Medium**	**Raised Adjacent Lenses**	⅛″	48″ x 132″	X		30 x 132	1¾ lbs.
				¼″	48″ x 136″	X		30 x 136	3½ lbs.
AKLO—Ribbed		**Medium (Directional Spread)**	**Fine Parallel Ribs**	⅛″	48″ x 132″	X		30 x 132	1¾ lbs.
				¼″	48″ x 136″	X		30 x 136	3½ lbs.
				wire glass					
AKLO—Hammered	**Same as for AKLO Heat Absorbing Figured Glass. However, being wired each is a non-scatterable, fire-retardant glass**	**Medium**	**Raised Adjacent Lenses**	¼″	48″ x 144″	X		30 x 144	3½ lbs.
AKLO—Ribbed		**Medium (Directional Spread)**	**Fine Parallel Ribs**	¼″	48″ x 144″	X		30 x 144	3½ lbs.
AKLO—Polished Wire (Hex. Mesh only)		**None**		¼″	60″ x 144″		X		3½ lbs.

***Available up to 60 inches depending upon condition of stocks on hand**

****Frosted AKLO provides excellent diffusion of light, high degree of obscurity and effective glare reduction.**

COMPARATIVE QUALITIES OF AKLO AND ORDINARY GLASS

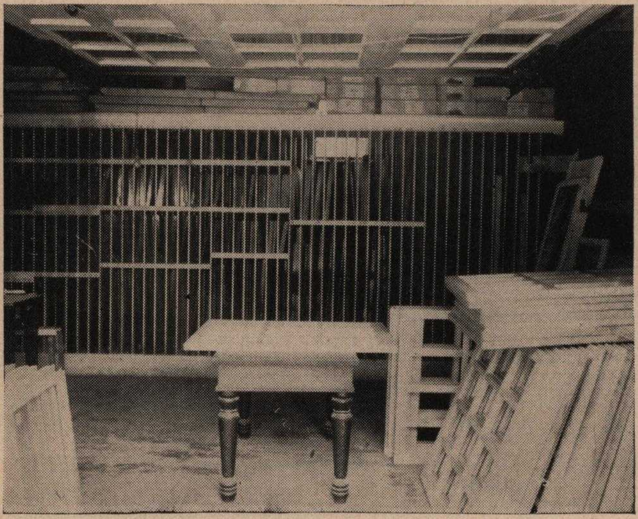
Thickness and Kind of Glass	Heat						Efficiency
	Heat and Light in Sun's Rays	Heat and Light Reflected from the Glass	Heat of Sun Absorbed by the Glass	Total Heat of Sun Entering Room Through Glass			Ratio of light transmission to heat passing directly through glass
				Reradiated by the glass	Transmitted directly through glass	Total heat entering through the glass	
HAMMERED PATTERN							
⅛″ Aklo Glass—Unwired	100.00%	9.60%	56.60%	28.30%	33.80%	62.10%	1.87:1
⅛″ Ordinary (Lime) Glass—Unwired	100.00	9.60	3.70	1.85	86.70	88.55	1.03:1
⅛″ Frosted Aklo Glass—Unwired	100.00	9.00	68.00	34.00	23.00	57.00	1.87:1
¼″ Aklo Glass—Unwired	100.00	9.60	69.70	34.85	20.70	55.55	2.58:1
7/32″ Ordinary (Lime) Glass—Unwired	100.00	9.60	7.40	3.70	83.00	86.70	1.07:1
¼″ Aklo Glass—Wired	100.00	9.60	71.40	35.70	19.00	54.70	2.57:1
¼″ Ordinary (Lime) Glass—Wired	100.00	9.60	11.20	5.60	79.20	84.80	1.07:1
¼″ Frosted Aklo Glass	100.00	9.00	77 40	38.70	13.60	52.30	2.58:1
RIBBED PATTERN							
⅛″ Aklo Glass—Unwired	100.00	8.50	56.50	28.25	35.00	63.25	1.87:1
⅛″ Ordinary (Lime) Glass—Unwired	100.00	8.50	3.60	1.80	87.90	89.70	1.03:1
⅛″ Frosted Aklo Glass—Unwired	100.00	9.00	68.30	34.15	22.70	56.85	1.87:1
¼″ Aklo Glass—Unwired	100.00	8.50	70.80	35.40	20.70	56.10	2.58:1
7/32″ Ordinary (Lime) Glass—Unwired	100.00	8.50	7.20	3.60	84.30	87.90	1.07:1
¼″ Aklo Glass—Wired	100.00	8.50	72.60	36.30	18.90	55.20	2.57:1
¼″ Ordinary (Lime) Glass—Wired	100.00	8.50	12.70	6.35	78.80	85.15	1.07:1
¼″ Frosted Aklo Glass	100.00	9.00	77.80	38.90	13.20	52.10	2.58:1
FOR COMPARISON ONLY							
⅛″ Aklo Glass—Polished	100.00	8.00	54.00	27.00	38.00	65.00	1.87:1
⅛″ Ordinary (Lime) Glass—Polished	100.00	8.00	3.70	1.85	88.30	90.15	1.03:1
¼″ Aklo Glass—Polished	100.00	8.00	71.00	35.50	21.00	56.50	2.57:1
¼″ Ordinary (Lime) Glass—Polished	100.00	8.00	7.50	3.75	84.50	88.25	1.07:1

SOURCE OF SUPPLY

The source of supply of glass items for the lumber and building material dealer is your glass distributor. The chances are that his representative is already calling on you, that you are already buying some items from him. Get to know him better; ask him for suggestions on building up your glass department. He can give you advice tailored to fit your special requirements. He can give you help on pricing, estimating, and ordering. Also he can be of assistance on technical problems and recommend the proper type of glass to fill specific needs.

A word or two about shipments. The demand for glass is unprecedented. The glass manufacturing industry is producing at the highest rate in history—far greater than during any war or pre-war period. Production facilities have been increased, but whether or not the present rate can be maintained, or increased, depends upon the supply of soda ash, an essential glass ingredient which continues to be in short supply. In spite of high production, supply does not meet demand. Manufacturers are dividing the available glass among the glass distributors in as fair and equitable a manner as possible. So your glass distributor may not be able to make shipments as promptly as he would like or as promptly as he usually does in normal times. But he will do his very best to fill your needs.

In these special racks glass can be stored by size and type.



But such a situation is not unfamiliar to you. It exists with respect to a very great many of your products. And now is the time for planning. Now is the time to build up your glass department which will permit you to get extra volume during the period of heavy demand and will establish you in a replacement market which is comparatively unaffected by business cycles.

MERCHANDISING GLASS

Many lumber and building material dealers have found that glass need not be just a service item; it can be the source of profitable business. The most successful have also found that it pays to set up a glass department in their sales room. It is best to have the cutting table and neat glass bins on the sales floor where customers can observe the cutting operation and be reminded of their glass needs. Such an arrangement will cause them to remember you when they need glass later.

Maintain a floor display in your sales room. Equip several of your sample doors with full length door mirrors. Have on display several small pieces of furniture with glass tops. A sample fireplace with an over-mantel mirror will help sell mantels and hardware as well as mirrors.

Use signs, display material, and mailing pieces which your glass distributor can supply to you. Include glass in your regular advertising and run special glass ads especially just before the fall replacement season. Keep in mind that every customer for other types of material is also a potential glass customer. In many instances bills of material for new construction and remodeling can be increased by the addition of wall, over-mantel, and door mirrors and by glass furniture tops and shelving.

Odd light glazing is profitable business if you are properly equipped. For those customers who wish to make their own replacements, keep packaged putty, glazing points, putty-knives, and glass cutters displayed in your glass department.

No set of merchandising suggestions can fit every individual situation, but there is one important principle which is universally applicable. It is this: glass sales can become important and profitable if they receive careful consideration and planning. A certain amount of glass business will automatically come to you like the demand for nails, cement, and bricks, which everyone takes for granted that you are handling, but to build up your glass volume you must let your customers know that you can supply their glass needs and you must display, advertise, and sell glass aggressively.

Editor's Note—The reader will note that brackets ( ) are placed in front of certain items listed in this section. This is designed as a guide to the retail salesman in selling. The manager should check (√) those items which will normally be carried in stock. If the item is not normally carried in stock but will be secured for the customer the following (X) check should be used. If, however, the item is not to be sold under any circumstances, the check (O) should be used.

Space is provided for the insertion of additional items.

SALES ITEMS

( ) Window Glass
    ( ) "AA" Grade
    ( ) A Grade
    ( ) B Grade
    ( ) Greenhouse Grade
( ) Plate Glass
    ( ) Regular Plate
    ( ) Color Clear Plate
    ( ) Colored Plate
    ( ) Double Glazed
    ( ) Heat Absorbing
( ) Thermopane Insulating Glass
( ) Mirrors
    ( ) "A" Quality
    ( ) No. 1 Quality
    ( ) No. 2 Quality
    ( ) Transparent
( ) Tempered Plate Glass
( ) Vitrolite Structural Glass
( ) Laminated Safety Glass
( ) Wire Glass
( ) Aklo Heat Absorbing Glass
( ) Patterned Glass
    ( ) Louvrex
    ( ) Flutex
    ( ) Doublex
    ( ) Stylex
    ( ) Linex
    ( ) Hammered
    ( ) Ribbed
    ( ) Luminex
    ( ) Pointex
    ( ) Skytex
    ( ) Velvex
    ( ) Industrex
    ( ) Diffusex
    ( ) Pebblex
    ( ) Reglex
    ( ) Muralex
    ( ) Florex
( ) Wood Sash Putty
( ) Steel Sash Putty
( ) Glazing Compound
( ) Glaziers Supplies

Items Asked For But Not Normally Stocked

Volume and profits can be increased by expanding your glass business. The experience of hundreds of Retail Lumber and Building Material Dealers has proved that by providing a complete glass service you can acquire new customers and enlarge your sales to old accounts.

To accomplish this you have a friend who is able and ready to help you. He is your Libbey-Owens-Ford distributor. Get to know him better. He can supply you with the glass items described on the preceding pages and he can advise and assist you in building up your glass volume and profits.

If you don't already know your L-O-F distributor, write to the nearest Libbey-Owens-Ford district office, listed on the back cover, and you will be put in touch with him.

L O F

L·O·F BRANCH OFFICES

Atlanta 3, Georgia Jackson 2324
1001 Whitehead Building

Boston 16, Mass. Hubbard 0100
1437 Statler Building

Buffalo 3, New York Cleve. 0291
1126 Rand Building

Chicago 3, Illinois Central 2490
120 South Lasalle Street

Cincinnati 2, Ohio Main 6174
1611 Carew Tower

Cleveland 13, Ohio Main 7180
1302 Terminal Tower Building

Dallas 1, Texas Riverside 4026
1402 Tower Petroleum Building

Denver 2, Colorado Tabor 8015
414 Tramway Building

Detroit 2, Mich. Mad. 0080
610 Fisher Building

Indianapolis 4, Indiana Franklin 1363
724 Circle Tower

Kansas City 6, Missouri Victor 5360
1004 Baltimore Street

Los Angeles 13, Calif. Michigan 0854
905 Architects Building

Memphis 3, Tenn. 5-8225
1015 Farnsworth Building

Milwaukee 10, Wisc. Hilltop 3110
3121 N. 55th Street

Minneapolis 2, Minn. Main 8429
506 Savings & Loan Building

New York 22, New York Eld. 5-1025
570 Lexington Avenue

Philadelphia 2, Pa. Penny. 5-8666
1528 Walnut Street

Richmond 19, Va. 3-3034
1122 Mutual Assurance Society Bldg.

St. Louis 1, Missouri Central 9863
411 N. Seventh Street

San Francisco 5, Calif. Sutter 4360
812 Rialto Building

Seattle 1, Washington Seneca 2513
210 Lloyd Building

Toledo 3, Ohio Main 5291
Nicholas Building

Washington 5, D. C. Republic 4472
1010 Shoreham Building

Libbey·Owens·Ford Glass Company
TUF-FLEX
Tempered Plate Glass

Libbey·Owens·Ford Glass Company
L O F
Plate Glass
Glazing Quality

Blue Ridge Glass Corp. · Kingsport, Tenn.
Manufacturers of Quality Glass

Libbey·Owens·Ford
Thermopane
Patented
INSULATING UNIT
with
BONDERMETIC SEAL
Trade Marks Reg.

L O F
HEAT *absorbing*
¼" Polished Plate Glass

Libbey·Owens·Ford Glass Company
L O F
Double Strength
A Quality

Libbey·Owens·Ford Glass Company
VITROLITE
Reg. U. S. Pat. Off.
Mechanically Ground and Polished Surface
X

A Great Name in Glass

LIBBEY·OWENS·FORD GLASS COMPANY
TOLEDO, OHIO

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